PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re patent appln. of : Stefan Kirchhoff, et al.

Appln. No: 10/525,686

Filed: February 22, 2005

For: **METHOD FOR REPAIRING A PROTECTIVE LINING OF AN INDUSTRIAL REACTION OR TRANSPORT VESSEL**

Confirm No. 9517

Examiner: David N. Brown, II

Art Unit: 1791

Docket No: 02-011

Mail Stop Appeal Brief-Patents
Commissioner of Patents
P.O. Box 1450
Alexandria, VA 22313-1450

APPEAL BRIEF

Sir:

This appeal brief is being submitted electronically on July 6, 2010 in support of the Notice of Appeal filed on May 6, 2010.

I. Real Party in Interest

The real party in interest is Specialty Minerals (Michigan) Inc.

II. Related Appeals and Interferences

There are no related appeals or interferences.

III. Status of the Claims

Claims 1-15 have been finally rejected.

The claims on appeal are claims 1-15.

IV. Status of Amendments

There were no amendments filed subsequent to final rejection.

V. Summary of the Claimed Subject Matter

As embodied in the sole independent claim, claim 1, the present invention provides a method for repairing a protective lining of an industrial reaction or transport vessel (specification, page 1, first full paragraph, lines 3-6; page 3, lines 16-17). The method includes several steps.

The steps include identifying areas of the lining having a thickness below a pre-determined threshold value by means of a measuring device (specification, page 3, lines 18-19). The measuring device measures the residual thickness of the lining (specification, page 3, lines 19-20). In addition to the measuring device, the method employs a processing unit (specification, page 3, lines 19-20) which carries out three steps.

In a first step, the processing unit transforms the residual thickness data into binary data, by comparing the measured residual thickness data with the predetermined threshold value for the thickness of the lining, and assign the binary value "1" to areas of the lining having a thickness below the pre-determined threshold value, and the binary value "0" to areas of the lining having a thickness equal to or higher than the pre-determined threshold value, or vice versa (specification, page 3, lines 20-25).

In a second step, the processing unit combines discrete isolated areas of the lining having a thickness below the pre-determined threshold value into combined areas of the lining (specification, page 3, lines 25-27). These combined areas are adjacent (specification, page 4, lines 28-29). In this second step, the binary value for areas of the lining having a thickness below the predetermined threshold value is assigned to these combined areas (specification, page 3, lines 27-28). However, each such combined area has a portion which was identified in the first step as having a binary value which

indicated that the portion had a measured residual thickness which was equal to or higher than the predetermined threshold value (specification, page 4, line 35 - page 5, line 4).

In a third step, the processing device computes the position and repair sequence of each of the combined areas and transfers these data to a repair device (specification, page 3, lines 28-30).

Finally, the method also includes applying monolithic lining material onto the combined areas computed by the processing unit by means of a repair device (specification, page 3, lines 31-32).

VI. Grounds of Rejection to be Reviewed on Appeal

A. Claims 1-7 and 10-15 stand finally rejected under 35 U.S.C. § 103(a) as being obvious over U.S. Patent 4,107,244 ("Ochiai") in view of U.S. Patent Publication 2002/0158368 ("Wirth," now U.S. Patent 6,780,351).

B. Claims 8 and 9 stand finally rejected under 35 U.S.C. § 103(a) as being unpatentable over Ochiai as applied to claim1 in view of U.S. Patent 4,690,328 ("Roehl").

VII. Argument

A. Claims 1-7 and 10-15 Are Not Obvious Over the Combination of Ochiai and Wirth, and the Rejection Under 35 U.S.C. § 103(a) Should Be Reversed

1. Argument With Respect to Claim 1

This rejection is based on erroneous fact finding by the Examiner, which leads to a legally erroneous conclusion. The Examiner has not correctly determined the scope and content of the prior art as is required in applying Section 103; nor has the Examiner correctly determined the differences between the presently claimed invention and the cited prior art. *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459, 467 (1966).

Specifically, the Examiner has not correctly stated the disclosure of either of the two prior art references upon which the Examiner relies, Ochiai and Wirth.

The Primary Reference Ochiai

The primary reference, Ochiai, discloses a method and apparatus for repairing the damaged surface of a refractory lined vessel (title, abstract), as well as a method for assessing the extent of damage (Fig. 2, col. 3, line 41- col. 4, line 66).

A microwave antenna is inserted into the vessel, and microwaves are transmitted through the antenna (abstract). The microwaves are reflected by the interior surface of the vessel, and the phase difference between the transmitted and reflected microwaves gives the distance ("r") between the antenna and the interior surface of the vessel (col. 4, lines 30-34) which is stored in a memory unit (reference number 13, Fig. 2), along with a signal corresponding to the position and orientation of the microwave antenna within the vessel. The memory unit has the distance between the antenna and the interior wall of a new vessel ("r_0") for the same position and orientation of the microwave antenna, and the difference between r and r_0 is computed by the memory unit and displayed (col. 4, lines 34-37). By rotating the antenna within the vessel and by moving the antenna vertically along the centerline of the vessel, the profile of the entire periphery of the vessel and the damage thickness can be obtained (col. 4, lines 38-46).

Ochiai uses a similar apparatus in his repair method (Fig. 6, col. 5, lines 5-16). However, in this case, the difference signal ($r - r_0$) is transmitted to a controller (19) for the hot repair apparatus which actually applies a gunning mix 21 to the interior surface of the vessel in order to accomplish the repair. The apparatus can be operated to record the profile of the interior of the vessel as the antenna is lowered into the vessel, and apply the repair material as the antenna is being lifted out of the vessel (col. 7, lines 24-40).

The Examiner misstates important steps in Ochiai's method.

First, the Examiner states that "Ochiai teaches (column 4 line 30) that the measuring device measures the residual thickness of the lining." This is not an accurate statement of Ochiai's method. Ochiai's device measures the actual distance between the microwave antenna and the worn surface of the lining (r). This distance is then compared with previously measured difference between the microwave antenna and the surface of a new lining (r_0) to give the thickness of the lining that has worn away from use of the vessel. Ochiai calls this the "damage amount" (col. 5, lines 17-21). The actual thickness of lining is not needed and never measured.

The Examiner also states that "Ochiai teaches the use of a processing unit that transforms the thickness data into binary data (column 6, line 63 - column 7, line 3, column 5 lines 18-26)." This is simply not true. The memory operation circuit 13 stores the difference $r - r_0$ as a function of the position and orientation of the antenna. There is no disclosure in Ochiai as to how the difference is stored. It could be stored as an analog signal or a decimal fraction.

The Examiner further states that "[t]he values r and r_0 are binary and are take to be the claimed "1 and 0" values." This is directly contrary to what Ochiai actually discloses. Ochiai discloses that r and r_0 are measured distances, not binary numbers. These measured distances need to be subtracted in order to determine where the gunning mixture is to be applied. If the Examiner's statement were correct, then Ochiai's process would be non-operational. If r is taken to be 1 and r_0 is taken to be 0, the difference would always be "1," and the gunning device would always be turned on (or off) regardless of the portion of the worn surface it was pointed at.

What Ochiai actually discloses is comparing the "damage amount" (that is $r - r_0$) with a "repair reference" such that when the damage amount exceeds the repair

reference, a signal is applied to the controller of the hot repairing device, which starts the operation of the repairing device (col. 5, lines 21-25). The amount of repair material applied at each position is determined by the damage amount, and the device 81 controlling the repair device stops the gunning nozzle at each specific position long enough to apply the required amount of gunning mix to repair the vessel liner at that position (col. 7, lines 28-40).

Presumably, one could keep a record of the amount of gunning mix applied at each position and review that record after the operation was completed. However, Ochiai does not disclose this. In addition, the profile measured during the first portion of Ochiai's process is not the same as keeping such a record, because Ochiai apparently compares the profile at each position with a "repair reference" to determine whether to apply gunning mixture at that position. Ochiai is not clear on this point; in particular it is not clear whether the "repair reference" is simply r_0 for that point on the surface or a third quantity or threshold value.

The Examiner also states that "Ochiai teaches combining these areas into areas having thickness below the threshold value (column 4, lines 30-36)." Again, Ochiai does no such thing, to the extent the Examiner's statement can be understood. First, there is no clear antecedent for "these areas" in the Examiner's rejection. According to the portion of Ochiai's disclosure referenced by the Examiner, the profile of the entire wear surface is measured and the damage amount of the entire surface can be obtained. There is simply no combination step disclosed, and certain no combination step conditioned on a "reference value." The damage amount, $r - r_0$, is obtained for the entire surface. There is no manipulation whatsoever of the profile or damage amount.

The Examiner further states that "Ochiai teaches that there is a step that computes the position (column 4 lines 30-36) and repair sequence (column 5 lines 15-

16) of each of the combined areas. . . ." This is not accurate. The position is measured, not computed, and there are no "combined areas." Ochiai does not expressly teach how the antenna is positioned. Presumably, this depends on the area subtended by the spray from the gunning nozzle, such that the smaller the area, the greater the number of positions which must be used to completely cover the interior surface with gunning material, if necessary. Further, there are no "combined areas." The gunning nozzle stops at each discrete position, and the amount applied depends upon the damage amount at that position. The damage amount at neighboring positions, for example, is not considered. The areas subtended by neighboring positions are not combined in any way. The Examiner's fact finding is erroneous.

The Secondary Reference Wirth

The Examiner's fact finding with respect to the secondary reference Wirth is similarly erroneous.

In particular, the Examiner inexplicably concludes that "[t]hus Wirth teaches that an adjacent combined area has a portion having a value which indicates that the portion has a measured residual thickness which was equal to or higher than a predetermined threshold value." This statement is wrong in its premises and wrong in its conclusion. Wirth nowhere teaches combining matrix values or vessel areas, so there are no "adjacent combined areas." Wirth does not make any comparison with a "predefined threshold value." The cited paragraph gives an example of how the matrix cell contents are computed, which appears to be applicable to every single matrix cell. There is no comparison with any threshold for any matrix cell, and no mention whatsoever of a threshold value.

The Examiner's Conclusion is Incorrect

The Examiner concludes that "[i]t would have been obvious to one having ordinary skill in the art at the time the invention was made to use the matrix method of Wirth in the invention of Ochiai motivated by a desire to use a linear algebra based algorithm for deciding which areas need repair."

The conclusion is also incorrect in both its premises and conclusion. Wirth does not use a "matrix method" or any methods of linear algebra for any purpose. Wirth's matrix is simply a collection of cells corresponding to discrete positions on the wall of the vessel, and defined by the linear and angular displacement coordinates of those positions. The cell contents correspond to the damage amount of Ochiai. Wirth's method is not used to determine which areas need repair. This is determined by comparison of the reference vessel characteristics with the actual characteristics of the vessel to be repaired.

Even if the Examiner had based his legal conclusion of obviousness on correct fact finding, the combination of the two references would not establish a *prima facie* case of obviousness because there is nothing in the combination or either reference which would disclose, teach or suggest the presently claimed in invention to one of ordinary skill in the art. In particular, the combination of references fails to even suggest limitations of the independent claim:

The cited references do not teach assigning a first binary value to areas of the lining having a thickness below a predetermined threshold value, and a second binary value to areas having a thickness equal to or greater than a predetermined threshold value. This is the first step carried out by the processing unit.

The cited references do not teach a "defragmenting" step, in which areas in need of repair are combined with adjacent areas that do not need repair, and assigned a

binary value indicating that the combined adjacent area indicating that it is in need of repair. This is the second step carried out by the processing unit.

In Ochiai, there is no computed combination of areas, as the measuring rod 41 is lifted to cause the gunning nozzle 48 to scan the lining surface, a signal is transmitted from the data recorder 80 to a device 81 for controlling the repair device, and the control device 81 steps the gunning nozzle at the position for a time according to the damage amount to spray the gunning mix to repair the damaged portion of the lining (col. 7, lines 24-40). All this occurs in real time.

Similarly, while Wirth carries out several steps in manipulating the data representing the measured interior geometry of the vessel ([0043] et seq.) and comparing the resulting "point cloud" with a set of reference vessel characteristics to give a "matrix" containing repair data for each "gunning cell" on the interior surface [0046], Wirth does not compute the combination of such "gunning cells." Like Ochiai, WIrth simply points and shoots at one cell at a time as the gunning device is raised and rotated in the vessel [0057].

Finally, the cited references do not teach computing the position and repair sequence for each of the combined areas. This is the third step carried out by the processing unit.

The Examiner's response to the applicants' argument that Ochiai does not teach a defragmenting which combines areas in need of repair with adjacent areas not in need of repair does not address these deficiencies. The Examiner states that the matrix method taught by Wirth takes into account all areas of the vessel and includes areas that need no repair. The Examiner gives a pair of exemplary matrices to illustrate Wirth's method citing to paragraph [0046]. The Examiner explains that here it can be seen that the adjacent areas include areas that need not be repaired.

However, in the example of Wirth's method provided by the Examiner, all the areas needing repair would be repaired, and adjacent areas not needing repair would not be repaired. The decision as to whether an area is to be repaired is based only on the state of the vessel wall at that matrix location. In contrast, in the presently claimed application, the decision is made based not only on the status of the specific cell, but also on the status of one or more adjacent cells. For the sake of efficiency, in the present method some "cells" that do not need repair will have gunning mixture applied anyway, because they have been included into an "adjacent area" with other "cells" that require repair. This concept is entirely absent in the cited references, and there is nothing in the combination of references to suggest this concept to one of ordinary skill in the art.

The presently claimed invention is not obvious over the combination of Ochiai and Wirth; the Examiner has not made out a *prima facie* case; and the rejection should be reversed.

2. Argument With Respect to Dependent Claims 2-7 and 10-15.

As to the dependent claims, applicants note that independent claim 1 from which claims 2-7 and 10-15 ultimately depend, is not obvious in view of Ochiai and Wirth, as argued above. However, "[i]f an independent claim is nonobvious under 35 U.S.C.103, then any claim depending therefrom is nonobvious." *In re Fine*, 837 F.2d 1071, 5 USPQ2d 1696 (Fed. Cir. 1988). Therefore, claims 2-7 and 10-15 which depend from claim 1 cannot be obvious over Ochiai and Wirth, and reversal of the rejection entered under 35 U.S.C. 103(a) over Shiao and Sherman is respectfully requested.

B. Claims 8-9 Are Not Obvious Over the Combination of Ochiai, Wirth, and Roehl, and the Rejection Under 35 U.S.C. § 103(a) Should Be Reversed

Roehl does not add anything to the combination of Ochiai and Wirth with respect to the unmet limitations of independent claim 1 from which claims 8 and 9 depend. Therefore, these dependent claims are not obvious over the combination of Ochiai, Wirth and Roehl.

Roehl discloses a portable spraying device for repairing refractory linings of melting crucibles in the steel industry. While Roehl discloses in detail the construction and method of operation of the portable spraying device, Roehl does not disclose any method for using the spray device to repair a vessel lining.

Since claims 8 and 9 depend from a non-obvious independent claim, and Roehl contributes nothing to the methods disclosed by Ochiai and Wirth, claims 8 and 9 must also be addressed to a non-obvious method.

Reversal of the rejection of claims 8 and 9 under 35 U.S.C. 103(a) is respectfully requested for this reason.

VIII. Conclusion

Reversal of both of the rejections entered is respectfully requested.

Respectfully submitted,

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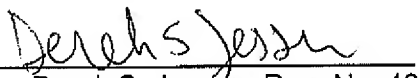

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CLAIMS APPENDIX

CLAIMS ON APPEAL:

1. A method for repairing a protective lining of an industrial reaction or transport vessel including the steps of identifying areas of the lining having a thickness below a pre-determined threshold value by means of a measuring device, which measuring device measures the residual thickness of the lining and a processing unit, which processing unit in a first step transforms the residual thickness data into binary data, by comparing the measured residual thickness data with the predetermined threshold value for the thickness of the lining, and assign the binary value "1" to areas of the lining having a thickness below the pre-determined threshold value, and the binary value "0" to areas of the lining having a thickness equal to or higher than the pre-determined threshold value, or vice versa, in a second step combines discrete isolated areas of the lining having a thickness below the pre-determined threshold value into adjacent combined areas of the lining to which the binary value for areas of the lining having a thickness below the predetermined threshold value is assigned such that an adjacent combined area has a portion which was identified in the first step as having a binary value which indicated that the portion had a measured residual thickness which was equal to or higher than the predetermined threshold value, and in a third step computes the position and repair sequence of each of the combined areas and transfers these data to a repair device, and applying monolithic lining material onto the combined areas computed by the processing unit by means of a repair device.

2. The method of claim 1, wherein the protective lining is a refractory lining.

3. The method of claim 1, wherein the industrial reaction or transport vessel is a metallurgical vessel.

4. The method of claim 3, wherein the metallurgical vessel is selected from a converter vessel an electric arc furnace, a blast furnace, a ladle, a turndish and a coke oven chamber.

5. The method of claim 4, wherein the ladle is selected from a steel casting ladle, pig iron ladle, torpedo ladle and slag ladle.

6. The method of claim 1, wherein the measuring device is a laser-based measuring device.

7. The method of claim 6, wherein the laser-based measuring device is a mirror scanner.

8. The method of claim 1, wherein the repair device comprises a manipulator arm and a gunning nozzle which is disposed thereon and is rotatable, tiltable and vertically movable.

9. The method of claim 8, wherein the repair device is selected from a spraying, a gunning and a shotcreting device.

10. The method of claim 1, wherein the processing unit is electronically connected with the measuring device and the repair device.

11. The method of claim 10, wherein steps within the processing unit are carried out electronically.

12. The method of claim 1, wherein the processing unit combines the isolated spots into rectangular combined areas.

13. The method of claim 12, wherein the position of each of the combined areas are computed in the form of cylinder coordinates.

14. The method of claim 1, wherein the residual thickness of the refractory lining is measured by the measuring device, after completion of the repair step, and these residual thickness data are compared with data obtained by a simulation regarding the

achievable reconstitution of the refractory lining, and in case of a deviation between the newly measured residual thickness data and the simulation data, the control unit of the repair device is calibrated accordingly.

15. The method of claim 14, wherein the residual thickness of the refractory lining is measured by the measuring device, after completion of the repair step and these obtained residual thickness data are compared with data obtained by a simulation regarding the achievable reconstitution of the refractory lining, and in case of a deviation between the newly measured residual thickness data and the simulation data, the processing and repair sequence is repeated.

EVIDENCE APPENDIX

No previously submitted affidavit evidence is being relied upon by appellants.

RELATED PROCEEDINGS APPENDIX

There are no decisions rendered by a Court or the Board regarding any related appeals or interferences.